Contribution ID: **40** Type: **Contributed talk**

Beam-cavity interactions in the rapid cycling synchrotron chain of the future muon collider

Thursday, 3 October 2024 15:00 (20 minutes)

The International Muon Collider Collaboration (IMCC) is engaged in a design study for a future facility intended for the collision of muons.Subsequent to the initial linear acceleration, the counter-rotating muons and anti-muons are accelerated in a chain of rapid cycling synchrotrons (RCS) up to the multi-TeV collision energy. To maximise the number of muons available in the collider, it is essential to exploit the time dilation of the muon lifetime by employing a large accelerating gradient.
The 1.3 GHz TESLA cavity serves as the baseline for the RCS chain. Considering the high bunch population and the small aperture of the cavity, the resulting beam-induced voltage per bunch passage is considerable, resulting in a substantial perturbation of the cavity voltage for the subsequent bunch passages. In this contribution, the effects of beam loading during the acceleration cycle for muons are calculated with the objective of determining the optimum parameters for minimising the cavity voltage transients. The interaction of the induced voltages by the counter-rotating beams is also considered. The results are subsequently used to estimate the impact of the transient beam loading on the muon acceleration and survival rate in the RCS chain. This work has been sponsored by the Wolfgang Gentner Programme of the German Federal Ministry of Education and Research (grant no. 13E18CHA).

Primary author: THIELE, Leonard (University of Rostock, CERN)

Co-authors: Dr GRUDIEV, Alexej (CERN); Dr BATSCH, Fabian (CERN); Dr DAMERAU, Heiko (CERN); KARPOV, Ivan (CERN); Prof. VAN RIENEN, Ursula (University of Rostock)

Presenter: THIELE, Leonard (University of Rostock, CERN)

Session Classification: Sessions in Living Room 1+2

Track Classification: A-2 Modeling of Current and Future Machines